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As an assist to the superintendent and members of his staff, this booklet has been prepared for obtaining information in the field of building, planning and construction. Topics discussed are--(1) structure, (2) roofs, (3) floor construction, (4) floor finishes, (5) ceilings, (6) exterior wall construction, (7) interior walls and partitions, (8) wainscots, (9) door frames and doors, (10) fenestration, (11) hardware, (12) air conditioning systems, (13) lighting, (14) television, (15) plumbing, (16) material and equipment samples, and (17) new products and materials. (RK)

MATERIALS FOR SCHOOL CONSTRUCTION

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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MATERIALS FOR SCHOOL CONSTRUCTION

In any school district the superintendent must be a "man of many hats." He must thoroughly understand the many aspects of school law, and the "ins and outs" of the Minimum Foundation Program, be the school's leading public relations man, and so on, and on, and on.

One of the areas of activity in which most superintendents become involved at some time or another, and for which they probably have the least training and background, is the construction of new or remodeling of old school buildings. This calls for some knowledge of various types of construction, construction materials and equipment, construction practices, legal aspects of a building program, etc.

This booklet has been prepared to assist the superintendent and members of his staff to obtain information in the field of building planning and construction.

During the planning stage of a school building, and after all educational aspects have been accounted for, the No. 1 consideration, from the administrator's point of view, should be "ease of maintenance" of the proposed structure. The problem of custodial care and maintenance will be present for the life of the building and, therefore, should be a vital consideration in the selection of materials, finishes, and equipment.

Administrators cannot be expected to know all about every item incorporated in a building, but an architect should know or have someone available who does. Therefore, administrators should take the position that "If I don't know the answer, ask questions," and cause the architect to explain and justify all decisions pertaining to the selection of materials, finishes, or equipment including systems or methods of construction.

If the school's officials are to exercise the control and maintain a position of informed authority required in the development of a building program, they must become well informed in the many facets of such a project.

A major need of all schools, especially those faced with an immediate building project, is the development of a set of "Requirements, Standards, and Procedures" for the construction of the type of building (elementary or secondary) concerned.

Many people are prone to criticize the architects for taking such a strong lead in a school building program. However, it is readily admitted that someone must take the lead and, if no one else will do it, the architect must.

Therefore, it behooves the school administrator, if he is to be the controlling authority, to be familiar with the various elements that have traditionally been the basis of the school building design and to be aware of present-day trends that are influencing the functional arrangement and design of schools.

Some of the present-day trends that are influencing the functional arrangement of schools are:

1. Multi-purpose areas designed for two or more uses, such as mass feeding, school assemblies, and P-TA meetings, or physical education classes, community cultural programs, and summer recreational activities.
2. Team-teaching facilities where groups within the same grade or interest level are combined to meet with a teacher of specific interest, training, or talent. This is usually accomplished by the use of mobile partitions.
3. Television instruction for individual classes or combined groups.
4. School philosophy and the tendency to consider the elementary school as being composed of the primary and intermediate divisions.
5. The development of central library facilities in all school levels and its use as a community facility.
6. The extended services of itinerant teachers in specialized fields, e.g., speech therapy, clinical reading, etc. as well as health services.
7. Year-round climate control of buildings which involves cooling as well as heating.
8. Increased quantities and use of teaching devices and materials, particularly in the audio-visual field.

All the above trends will have an effect in varying degrees on the design of school facilities and this in turn will affect the selection of materials.

When the planning of a new building has progressed to the point where material selections must be made, the architect may have many reasons for his choices. The school administrator should respect the architect's reasons for his choices but should question and evaluate the various materials selected in the light of what the determining factors are from his point of view.

These factors may be --

Durability or ruggedness. School children are active, energetic masses of people who often act without thinking about the consequences and as a result tend to be destructive of fragile materials.

Frequency of needed repair. Does the suggested material have a history of long life, or does it require frequent repair?

Ease and cost of repair. Is the item or material so designed that repairs can be performed easily and inexpensively?

Background of material. Is the material thoroughly tested through usage, or is it something relatively new in the field of usage proposed? Is the manufacturer an established and reliable company who can be expected to be in existence for many decades to come, or is he new and of questionable reliability?

Maintenance. Is the item or material such that it is easily and inexpensively maintained?

Insurability. Is the material of a type that will contribute to lowering the insurance rating on the building, or does it cause a penality?

Quality. Do the total plan and the material as selected form a good economical solution to the problem, or is it simply a cheap-way-to-get-by-for-now solution?

STRUCTURE

Generally, the structural system to be used will be determined by the architect and/or engineer. However, the school administrator should make certain that the system used meets all the requirements called for under the State Insurance Board's semi-fireproof classification. There are three levels of the semi-fireproof rating and the building should be designed to meet the best level (generally, No. 2) that the district can afford. Furthermore, the system should be so designed that it can be erected with expediency. The system should also provide for the judicious use of expansion joints.

The administrator might request the architect to thoroughly explore the possible use of premanufactured units.

ROOFS

The administrator should be informed as to the type of roof proposed, the type and caliber of deck over which it is to be applied, and its bonding quality. Again, the Insurance Board's semi-fireproof rating should be taken into account.

In November 1966 there was a change made in the Built-Up Roof Bonds which should be thoroughly studied before any decision is made to omit the Roof Bond from the contract.

The use of plastic dome skylights has been successfully accomplished in schools. However, there are certain limitations that should be recognized, such as (1) domes should be white, translucent plastic with a built-in, reflecting quality to reduce glare, (b) domes should be installed on curbs to insure water-tightness, and (c) domes should only be installed in activity- or traffic-type areas such as the gymnasium, lunchroom, dressingrooms, shops and corridors.

FLOOR CONSTRUCTION

Concrete slab-on-fill is the most widely used system of floor construction. Where conditions dictate a suspended floor slab, a comparison of the various types should be made to arrive at the one most economical. Monolithic finishes should be troweled from the concrete mixture or poured without adding dry cement to the surface.

This is a phase of the work where the average administrator will need to be thoroughly informed by the architect.

FLOOR FINISHES

This is the part of the floor that shows and that requires custodial care. Therefore, it is essential that the administrator be thoroughly familiar with the various types of floor finish and the areas where they are most suitable. He should be as specific as possible in stating where he desires terrazzo, carpet, ceramic tile, vinyl asbestos tile, etc. to be installed.

After appearance and durability, the principal consideration in the selection of the finish floor material should be its maintenance characteristics. The carpet herein referred to is of the dense, heavy duty, commercial grade carpet and not the loosely-woven, high-pile, residential-type carpet.

Suggested Floor Finishes

Classrooms and corridors--Grade "C" vinyl asbestos tile, terrazzo, or carpet.

Dining areas, homemaking, laboratories, etc.--Grade "C" vinyl asbestos or terrazzo.

Restrooms--ceramic tile or terrazzo

Lunchroom, kitchens--quarry tile in grout with hardener additive,

Stages--soft wood.

Storage, utility areas, etc.--finish concrete.

CEILINGS

Generally, all ceilings in instructional and related areas should be of a type having acoustical qualities. Suspended, tile-type ceilings should be of a mineral-board material.

Ceilings in service areas and those areas subject to excessive moisture, steam, grease, etc. should be of a smooth plaster that is resistant to these conditions and can be scrubbed.

EXTERIOR WALL CONSTRUCTION

This is a selection that is generally left to the architect. Brick masonry backed with clay tile or exposed concrete block is a general practice. However, there are several types of wall-panel systems that may be considered. Should the architect make a selection, other than the standard brick masonry, he should have cause to justify his decision.

The system of expansion joints is an important consideration in this phase of the work.

INTERIOR WALLS AND PARTITIONS

The selection of interior wall and partition materials and finishes is determined by the function they are to perform. Some partitions need to be permanent, others need to be movable or removable, and others need to be soundproof, etc. In all cases, care and maintenance should be of prime consideration.

Certain wall and partition surfaces within the building are considered critical. These surfaces are those that are subject to excessive wear, soil, or disfiguring due to their location. These surfaces should be finished with material that is scrubbable, resistant to scarring, or is impervious, such as glazed tile, hard brick, etc.

Some of these critical surfaces are:

- the chalkboard wall below the board
- exposed corridor walls
- walls adjacent to door jambs and at light switches
- walls adjacent to and within restrooms, at drinking fountains
- kitchen walls
- all other walls subject to excessive soiling

All other wall or partition surfaces that are not considered critical may be finished in painted masonry, finished gypsum board or plywood paneling.

WAINSCOTS

All wainscots should be of impervious material such as ceramic tile, glazed brick, etc.

DOOR FRAMES AND DOORS

Most experienced administrators will request metal door frames, when possible, because of their sturdiness and resistance to abuse. All steel door frames should be treated to resist rust and should be given a factory-applied prime coat of paint. Exterior steel door frames will be similar to interior steel frames except they will be of a heavier gauge.

Except where aluminum and glass door assembly units are used, all exterior doors should be steel. Interior doors may be of wood in the style desired. Classrooms with a glass vision panel may be desirable. If hollow-core, flush panel doors are used, be certain they have adequate hardware jambs.

Doors should open through 180° except where restricted by right-angle walls. Particular care should be taken in the selection of doors--types and weight of hardware used, the extent of door swing or opening, and their exposure. Doors exposed to the weather or to excessive use should be of good quality.

FENESTRATION

Large glass areas are a constant maintenance problem and should be avoided.

If aluminum windows are used, they should be AAMA rated "A-2" or better in either the single- or double-hung type with inside glazing beads.

Windows for special cases should be of good quality suitable for the purpose needed.

Samples of all types submitted in advance should be required.

HARDWARE

In general, hardware should be heavy duty. Use surface-mounted, panic devices and mullion on exterior doors with full rack and pinion closers. All lock systems should be master-keyed.

AIR CONDITIONING SYSTEMS

Since 1965 there has been a decided trend to build air conditioned school buildings. The selection of the type of system to be used will generally be made by the designing engineer and the architect. However, the school administration should be shown the choices available and should be given the reasons for the selection made. Again, maintenance and operation costs and the flexibility of use should be the primary concern of the administration and these factors should be thoroughly examined.

The most widely used type of air conditioning system in school buildings is the chilled-water type designed to serve zones of the building for year-round climate control.

LIGHTING

With the development of climate-controlled schools the importance of better planning of electric lighting has increased. The reduction in the glass area of classrooms cause the electric lighting to be the principal source of light within the room. It is no longer auxiliary light for cloudy days. Slimline, fluorescent fixtures have proven to be the most efficient and economical source of light.

The following is a list of the recommended foot-candle lighting levels at the working-surface plane for various areas and activities:

Classrooms ---------- 50 f.c.

Library ---------- 70 f.c.

Auditorium ---------- 15 f.c.

Lunchroom ---------- 30 f.c.

Corridors & stairs -- 20 f.c.

In classrooms, libraries, etc. the uniformity of the light coverage is equally important with the foot-candle level. Furthermore, adequate outlets should be provided in teaching areas for the operation of electric equipment.

TELEVISION

The development of educational television is increasing rapidly. All school building projects should include provisions for installation of television, either now or in the future. The method and extent of this installation must be determined by the local administration.

PLUMBING

For reasons of good maintenance and sanitation all plumbing fixtures including water closets, urinals, and drinking fountains should be wall hung.

Inaccessible waterlines should be copper. All plumbing-runs under concrete slabs should be held to a minimum and should be installed in accordance with national or local codes.

MATERIAL AND EQUIPMENT SAMPLES

It is in the best interest of the school to have the architect require that samples be submitted of material or equipment proposed for the project. Administrators should not hesitate to request samples for examination if it involves anything with which they are not familiar.

NEW PRODUCTS AND MATERIALS

There is a never-ending flow of new products, new materials, and old products being made with new materials being introduced into the building market. Administrators are advised to keep an open mind about such items and at the same time not be gullible and accept anything simply because it is new.

In this area it is a good policy to "let someone else be the first." All such items should be thoroughly examined, tested, and the administrator thoroughly convinced of the merits of the item before accepting its inclusion into the project.

STATE REQUIREMENTS

The Use of LP (liquid petroleum) Gas

The use of LP gas is under the jurisdiction of the Texas Railroad Commission. All installations must be done by specially-licensed plumbers and must be inspected and approved by an agent of the Texas Railroad Commission.

Well-Water and Septic Tanks

All proposed school plant septic-tank and water-well installations must be examined and approved by the Texas State Department of Health prior to actual installation.

Fire Escape Law

This comes under the jurisdiction of the State Fire Marshall, Texas Insurance Commission and should be investigated if the proposed building is more than one story high.

There are NO State requirements, other than those above, now in effect for school buildings.